FIG. 1

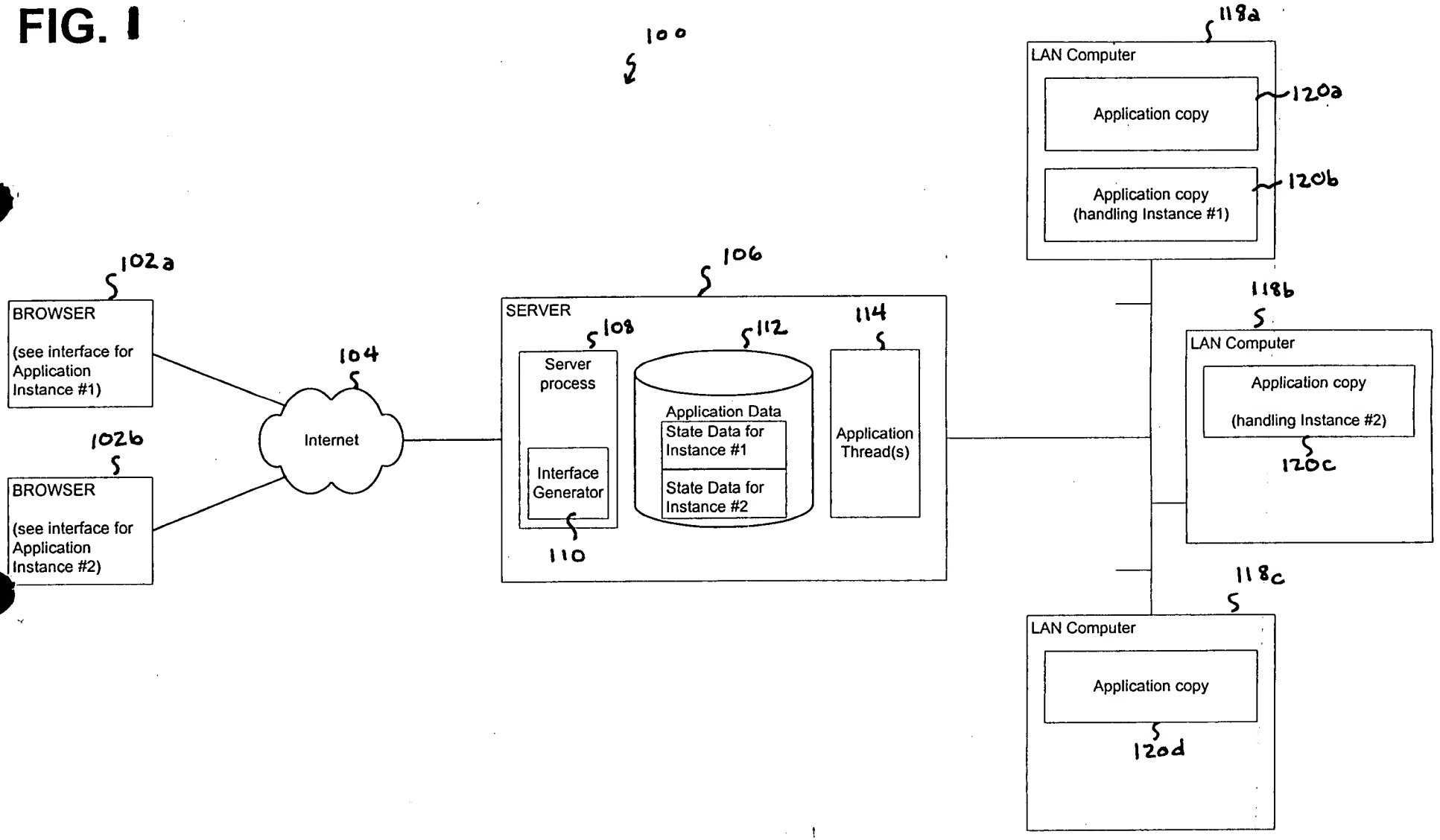

100
118a
LAN Computer
Application copy
120a
Application copy
(handling Instance #1)
120b
102a
BROWSER
(see interface for Application Instance #1)
102b
BROWSER
(see interface for Application Instance #2)
104
Internet
106
SERVER
108
Server process
Interface Generator
110
112
Application Data
State Data for Instance #1
State Data for Instance #2
114
Application Thread(s)
118b
LAN Computer
Application copy
(handling Instance #2)
120c
118c
LAN Computer
Application copy
120d

FIG. 2

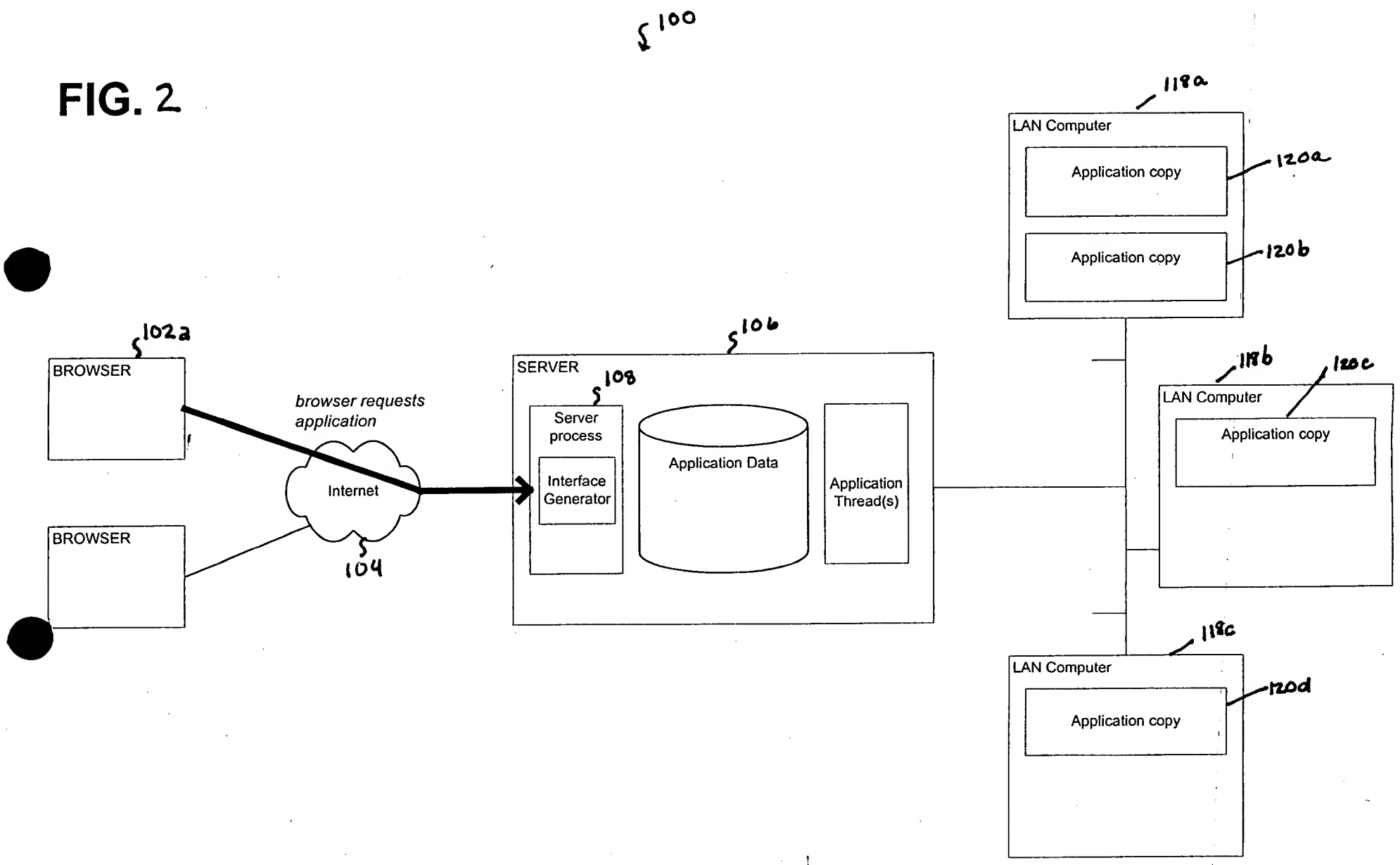

100
118a
LAN Computer
Application copy
120a
Application copy
120b
102a
BROWSER
106
SERVER
108
Server process
Interface Generator
Application Data
Application Thread(s)
browser requests application
Internet
104
BROWSER
118b
120c
LAN Computer
Application copy
118c
LAN Computer
Application copy
120d

FIG. 3

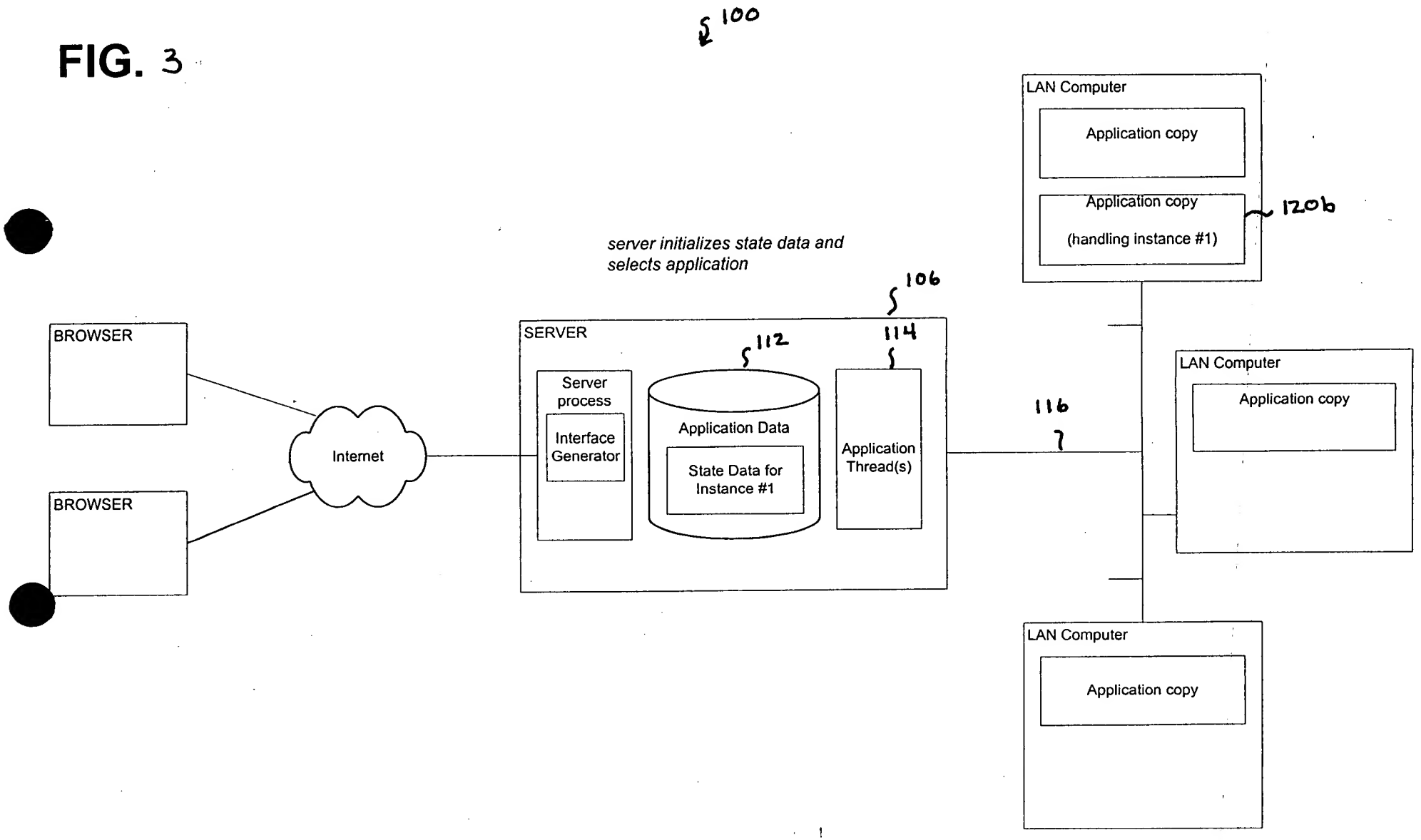

100
LAN Computer
Application copy
Application copy
(handling instance #1)
120b
server initializes state data and
selects application
106
BROWSER
BROWSER
Internet
SERVER
112
114
Server
process
Interface
Generator
Application Data
State Data for
Instance #1
Application
Thread(s)
116
LAN Computer
Application copy
LAN Computer
Application copy

FIG. 4

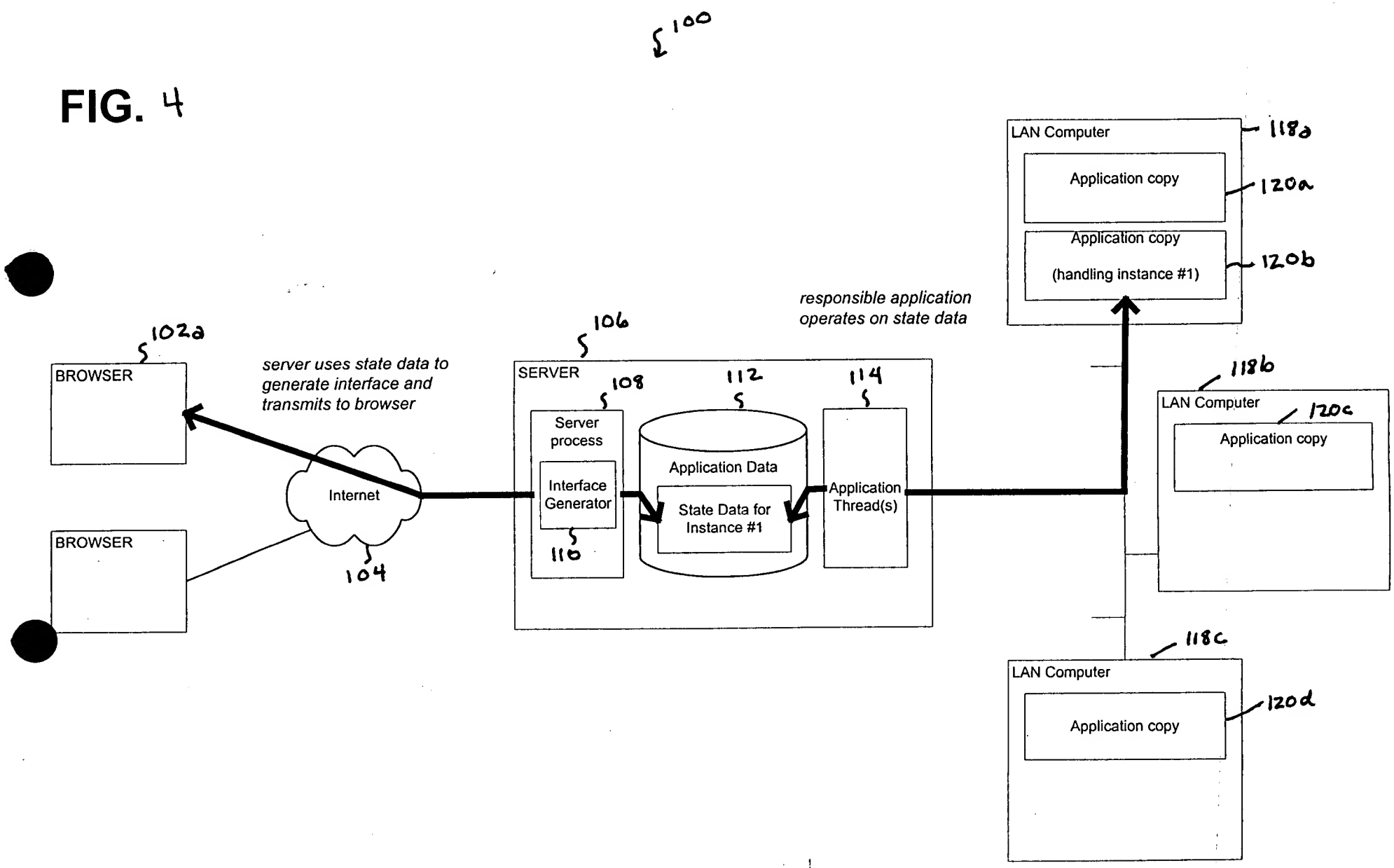

100
LAN Computer
118a
Application copy
120a
Application copy
(handling instance #1)
120b
responsible application
operates on state data
106
102a
BROWSER
server uses state data to
generate interface and
transmits to browser
SERVER
108
112
114
Server
process
Application Data
Application
Thread(s)
Interface
Generator
State Data for
Instance #1
110
Internet
BROWSER
104
118b
LAN Computer
120c
Application copy
118c
LAN Computer
Application copy
120d

FIG. 5

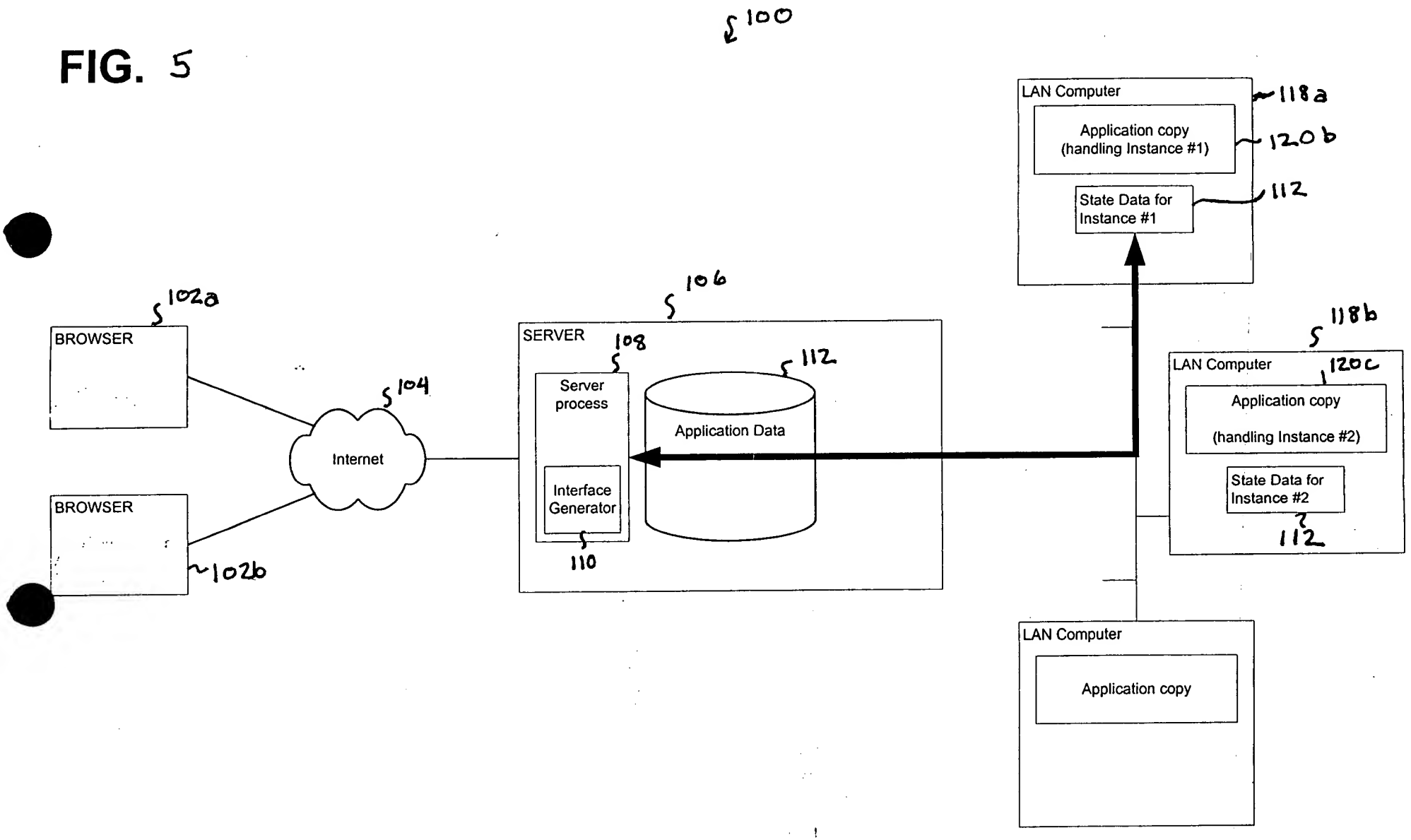

100
LAN Computer
118a
Application copy
(handling Instance #1)
120b
State Data for
Instance #1
112
106
102a
BROWSER
SERVER
108
112
Server
process
Application Data
104
Internet
Interface
Generator
110
BROWSER
102b
118b
LAN Computer
120c
Application copy
(handling Instance #2)
State Data for
Instance #2
112
LAN Computer
Application copy

FIG. 6

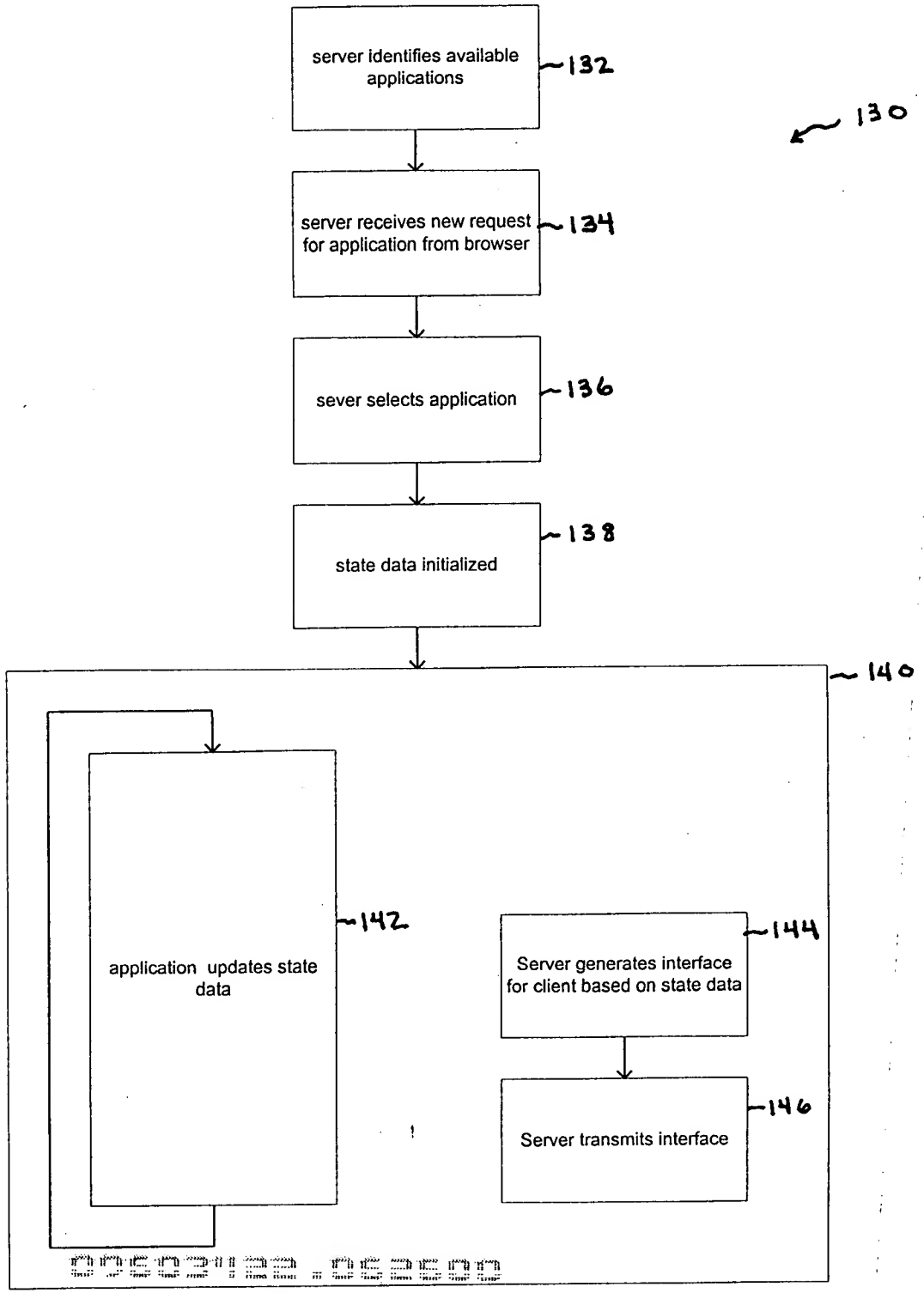
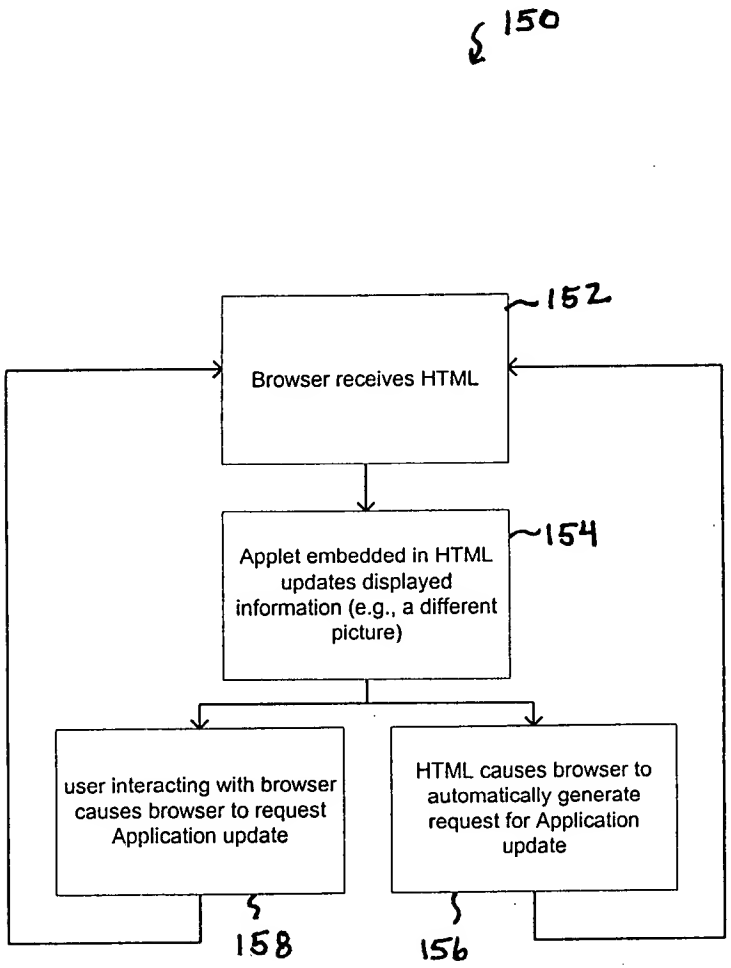

server identifies available applications
132
130
server receives new request for application from browser
134
sever selects application
136
state data initialized
138
140
application updates state data
142
Server generates interface for client based on state data
144
Server transmits interface
146

FIG. 7


150
152
Browser receives HTML
154
Applet embedded in HTML updates displayed information (e.g., a different picture)
user interacting with browser causes browser to request Application update
158
HTML causes browser to automatically generate request for Application update
156

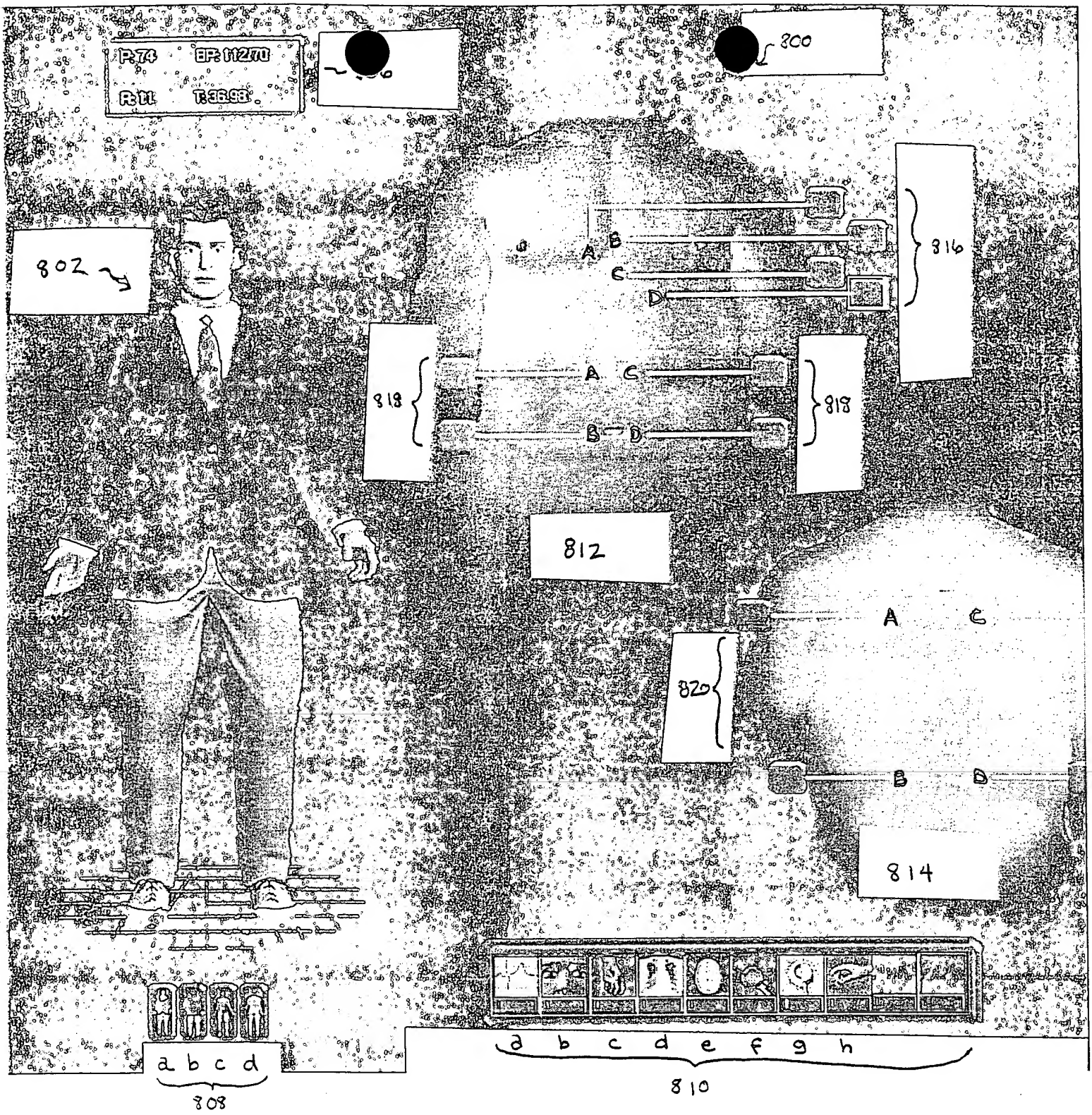

P:74 BP:11270
R:11 T:36938
800
802
316
A B
C
D
818
A C
B D
818
812
A C
820
B D
814
a b c d
808
a b c d e f g h
810

FIG. 8

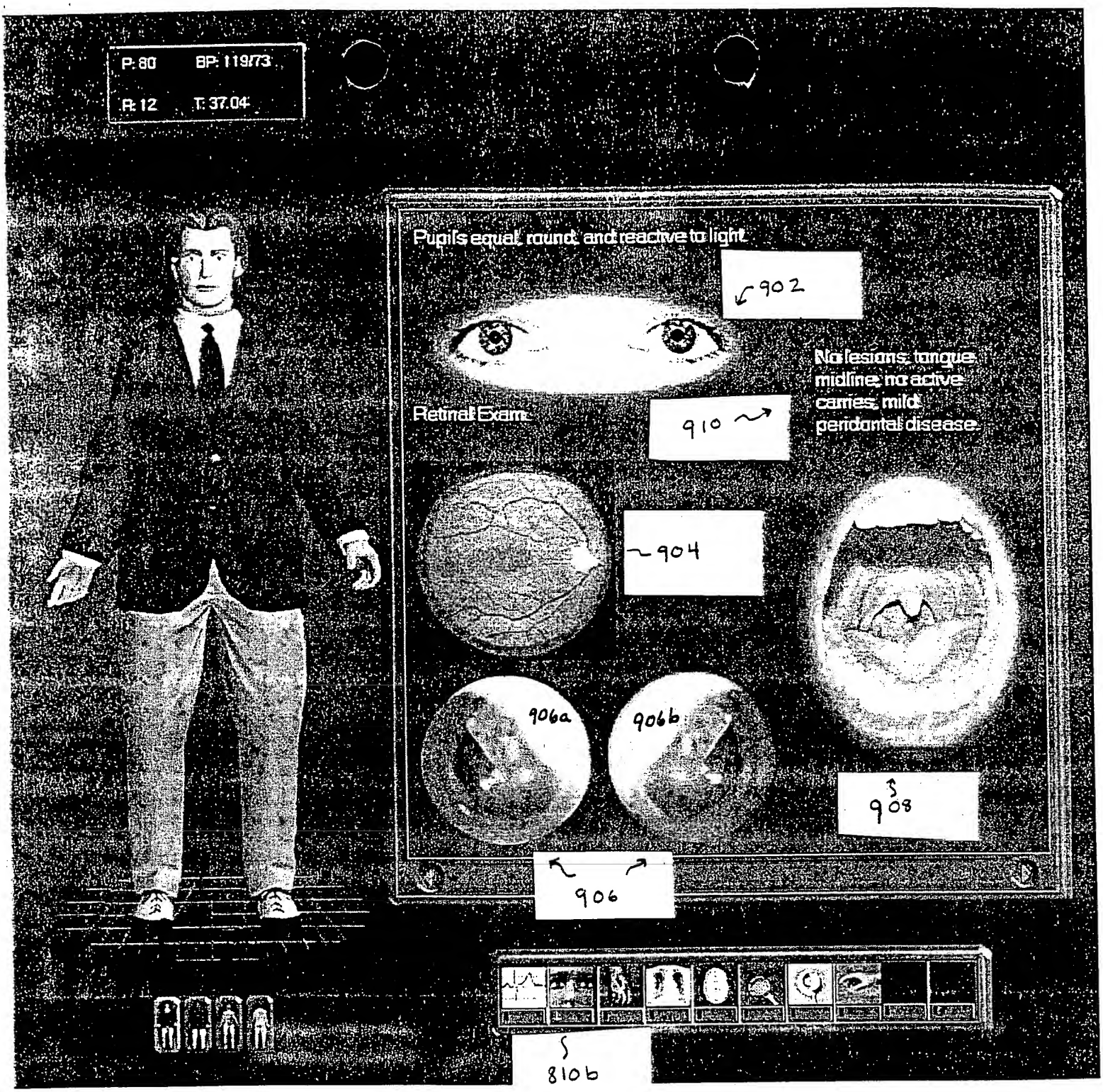

P: 80
BP: 119/73
R: 12
T: 37.04
Pupils equal, round, and reactive to light
902
Retinal Exam
910
No lesions; tongue midline; no active caries; mild peridontal disease
904
906a
906b
908
906
810b

FIG. 9

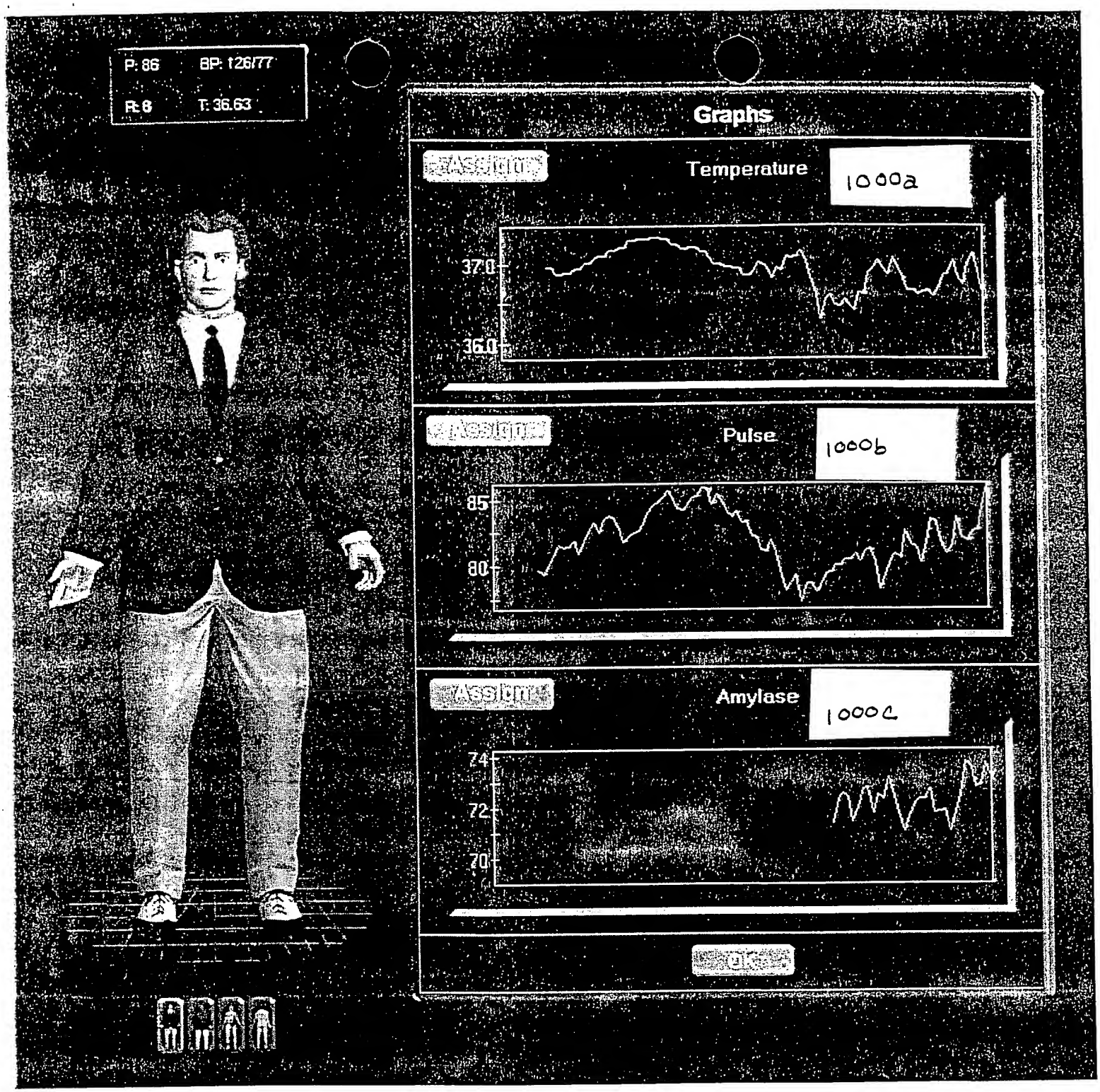

P: 86
BP: 126/77
R: 8
T: 36.63
Graphs
Temperature
1000a
37.0
36.0
Pulse
1000b
85
80
Amylase
1000c
74
72
70

FIG. 10

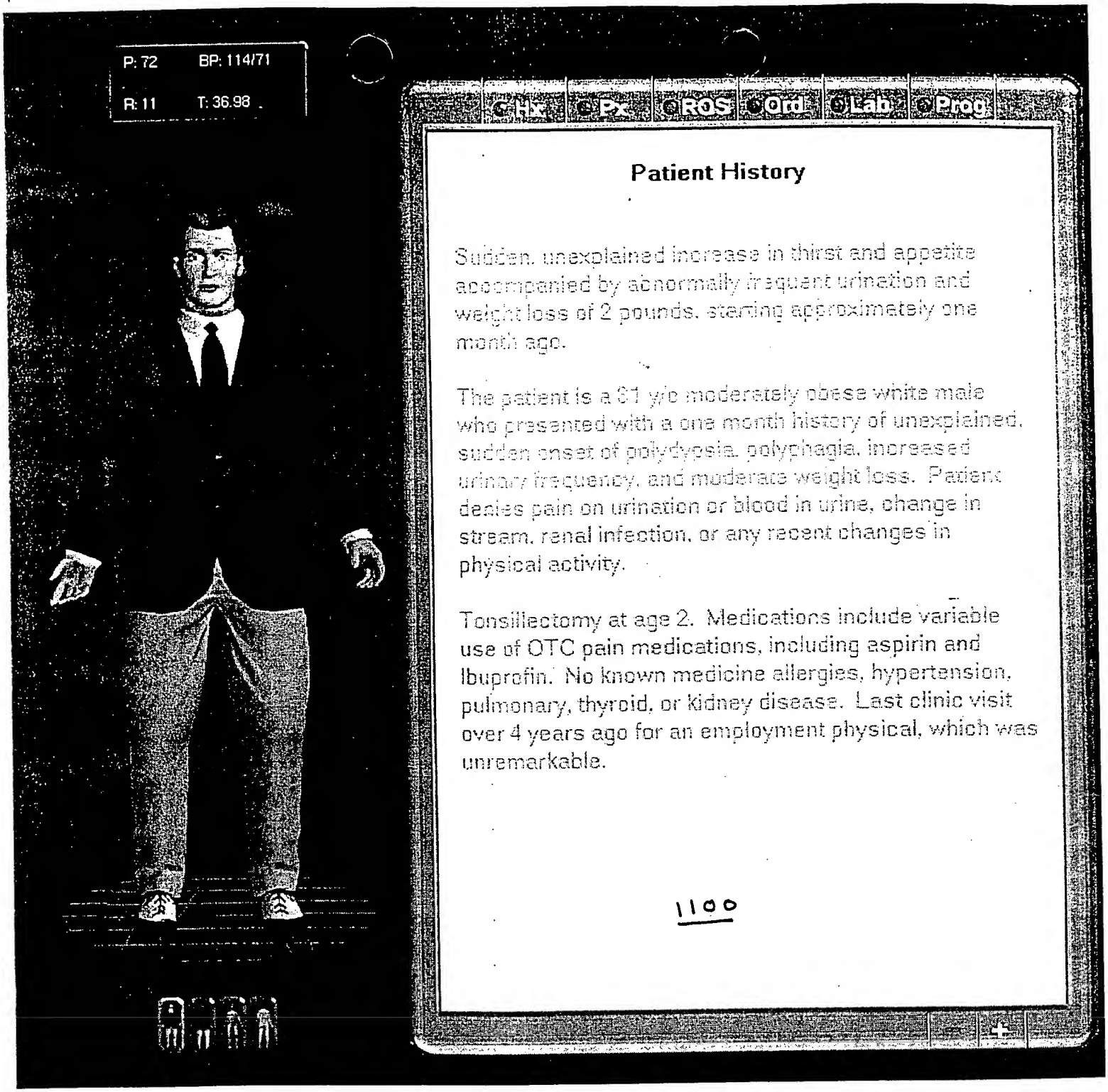

P: 72
BP: 114/71
R: 11
T: 36.98
Hx
Px
RoS
Ord
Lab
Prog
Patient History
Sudden, unexplained increase in thirst and appetite accompanied by abnormally frequent urination and weight loss of 2 pounds, starting approximately one month ago.
The patient is a 61 y/o moderately obese white male who presented with a one month history of unexplained, sudden onset of polydypsia, polyphagia, increased urinary frequency, and moderate weight loss. Patient denies pain on urination or blood in urine, change in stream, renal infection, or any recent changes in physical activity.
Tonsillectomy at age 2. Medications include variable use of OTC pain medications, including aspirin and Ibuprofin. No known medicine allergies, hypertension, pulmonary, thyroid, or kidney disease. Last clinic visit over 4 years ago for an employment physical, which was unremarkable.
1100

FIG. 11

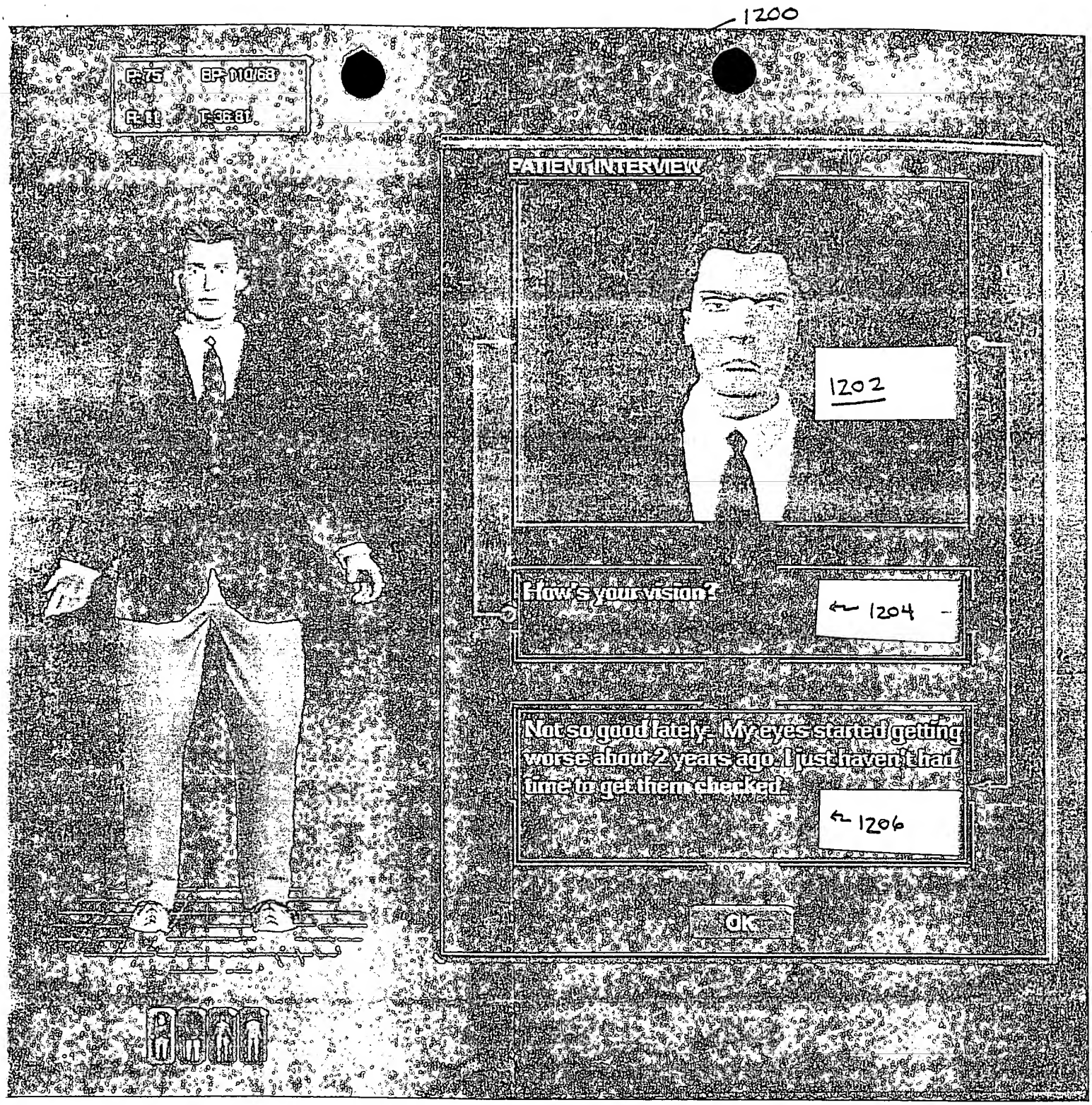

1200
P: 75 BP: 110/68
R: 11 T: 36.8
PATIENT INTERVIEW
1202
How's your vision?
1204
Not so good lately. My eyes started getting worse about 2 years ago. I just haven't had time to get them checked.
1206
Ok

FIG. 12

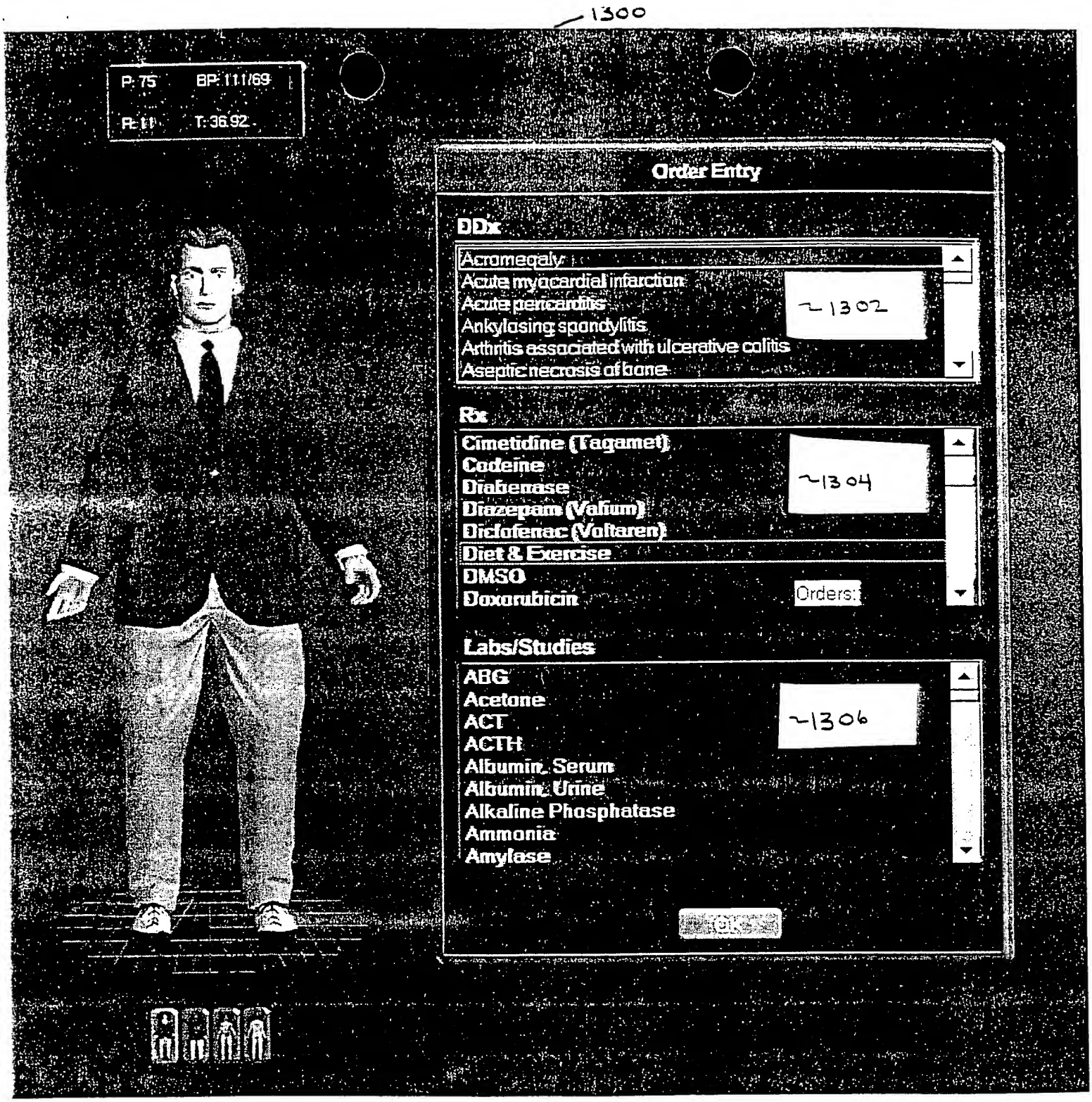

1300
P: 75
BP: 111/69
R: 11
T: 36.92
Order Entry
DDx
Acromegaly
Acute myocardial infarction
Acute pericarditis
Ankylosing spondylitis
Arthritis associated with ulcerative colitis
Aseptic necrosis of bone
1302
Rx
Cimetidine (Tagamet)
Codeine
Diabenase
Diazepam (Valium)
Diclofenac (Voltaren)
Diet & Exercise
DMSO
Doxorubicin
1304
Orders:
Labs/Studies
ABG
Acetone
ACT
ACTH
Albumin, Serum
Albumin, Urine
Alkaline Phosphatase
Ammonia
Amylase
1306
OK

FIG. 13

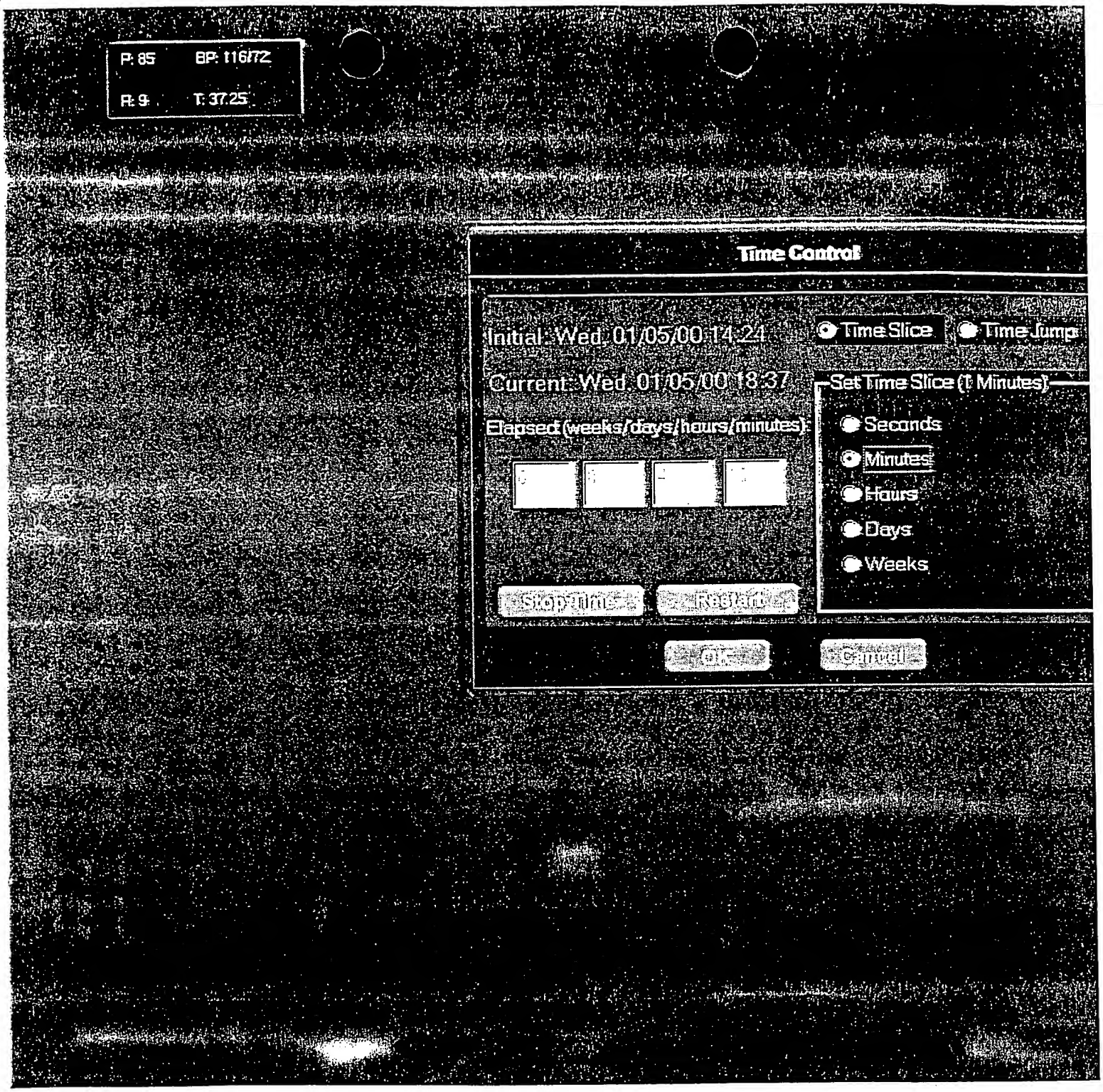

P: 85
BP: 116/72
R: 9
T: 37.25
Time Control
Initial: Wed, 01/05/00 14:24
Time Slice
Time Jump
Current: Wed, 01/05/00 18:37
Set Time Slice (1 Minutes)
Elapsed (weeks/days/hours/minutes):
Seconds
Minutes
Hours
Days
Weeks
Stop Time
Restart
OK
Cancel

FIG. 14

1502
```
Object Model Key "Patient Views"
Object Model MMFile1 "Body Renderings\MorphMan\aprime.jpg"
Object Model MMFile2 "Body Renderings\MorphMan\bprime.jpg"
Object Model MMFile3 "Body Renderings\MorphMan\cprime.jpg"
Object Model MMFile4 "Body Renderings\MorphMan\dprime.jpg"
```

1504
```
Object Model Key "ROS Head"
Object Model MMFile1 "Body Renderings\MFaces\Neutral.jpg"
```

1506
```
Object ABD Key "Front Auscultation"
Object ABD MMFile "Body Renderings\New_Male_Fat\FatChBkMAus.jpg"
Object ABD Sound1 "Wav Files\Other\Bowel1.wav"
Object ABD Sound2 "Wav Files\Other\Bowel2.wav"
Object ABD Sound3 "Wav Files\Other\Bowel3.wav"
Object ABD Sound4 "Wav Files\Other\Bowel2.wav"
```

1508
```
Object ABD Key "Front Percussion"
Object ABD MMFile "Body Renderings\New_Male_Fat\FatChBkMPercuss.jpg"
Object ABD Sound1 "Wav Files\Percussion\PercusDull.wav"
Object ABD Sound2 "Wav Files\Percussion\PercusDull.wav"
Object ABD Sound3 "Wav Files\Percussion\PercusFlat.wav"
Object ABD Sound4 "Wav Files\Percussion\PercusFlat.wav"
Object ABD Sound5 "Wav Files\Percussion\PercusResonant.wav"
Object ABD Sound6 "Wav Files\Percussion\PercusResonant.wav"
Object ABD Sound7 "Wav Files\Percussion\PercusDull.wav"
Object ABD Sound8 "Wav Files\Percussion\Exclame.wav"
```

1510
```
Object Chest Key    "Front Auscultation"
Object Chest MMFile "Body Renderings\New_Male_Fat\FatChBkMAus.jpg"
Object Chest Sound1 "Wav Files\Heart Sounds\Normal(A).wav"
Object Chest Sound2 "Wav Files\Heart Sounds\Normal(P).wav"
Object Chest Sound3 "Wav Files\Heart Sounds\Normal(T).wav"
Object Chest Sound4 "Wav Files\Heart Sounds\Normal(M).wav"
```

1512
```
Object Chest Key    "Back Auscultation"
Object Chest MMFile "Body Renderings\New_Male_Fat\FatChBkMAus.jpg"
Object Chest Sound1 "Wav Files\Breath Sounds\NormBSApex.wav"
Object Chest Sound2 "Wav Files\Breath Sounds\NormBSApex.wav"
Object Chest Sound3 "Wav Files\Breath Sounds\NormBSBase.wav"
Object Chest Sound4 "Wav Files\Breath Sounds\NormBSBase.wav"
Object Chest Sound5 "Wav Files\Breath Sounds\NormBSBase.wav"
Object Chest Sound6 "Wav Files\Breath Sounds\NormBSBase.wav"
```

1514
```
Object Chest Key    "Back Percussion"
Object Chest MMFile "Body Renderings\New_Male_Fat\ChBkMPercuss.jpg"
Object Chest Sound1 "Wav Files\Percussion\PercusResonant.wav"
Object Chest Sound2 "Wav Files\Percussion\PercusResonant.wav"
Object Chest Sound3 "Wav Files\Percussion\PercusResonant.wav"
Object Chest Sound4 "Wav Files\Percussion\PercusResonant.wav"
Object Chest Sound5 "Wav Files\Percussion\PercusResonant.wav"
Object Chest Sound6 "Wav Files\Percussion\PercusResonant.wav"
Object Chest Sound7 "Wav Files\Percussion\PercusFlat.wav"
Object Chest Sound8 "Wav Files\Percussion\PercusFlat.wav"
```

1516
```
Object CV Key    "EKG"
Object CV MMFile1 "EKGs\Normsinr.jpg"
Object CV Entry "Normal sinus rhythm with no signs of past or current cardiac events."
```

1518
```
Object Ext Key    "Extremities - Left Hand"
Object Ext MMFile1 "Extrem\MNLHand.jpg"
Object Ext Entry  "Left hand normal to inspection."
```

1520
```
Object Ext Key    "Extremities - Right Hand"
Object Ext MMFile1 "Extrem\MNRHand.jpg"
Object Ext Entry  "Right hand normal to inspection."
```

FIG. 15a

1522
```
Object Ext Key    "Extremities - Feet"
Object Ext MMFile1 "Extrem\MNFeet.jpg"
Object Ext Entry  "Feet normal to inspection."
```

1524
```
Object Heent Key    "Eyes Exam"
Object Heent MMFile1 "Pupils\NormEyes.jpg"
Object Heent Entry  "Pupils equal, round, and reactive to light."
Object Heent Description  "Pupils equal, round, and reactive to light."
```

1526
```
Object Heent Key    "Retinal Exam"
Object Heent MMFile1 "Eye Exam\MorphRetSmall\a.jpg"
Object Heent Entry  "Normal retinal exam."
Object Heent Description  "Retinal Exam."
```

1528
```
Object Heent Key    "Tympanic Membranes"
Object Heent MMFile1 "Ear Exam\NormalEarBi.jpg"
Object Heent Entry  "Tympanic membranes intact, no signs of fluid bilaterally."
Object Heent Description  " "
```

1530
```
Object Heent Key    "Throat Exam"
Object Heent MMFile1 "Throat\M_Throat_hu.jpg"
Object Heent Entry  "Throat is free of lesions"
Object Heent Description "No lesions, tongue midline, no active carries, mild peridontal disease."
```

1532
```
Object Neuro Key     "Speech Pattern"
Object Neuro MMFile1 "Wav Files\speech\MspeechN.wav"
Object Neuro Entry   "Normal speech pattern."
Object Neuro Description "Click button to hear speech"
```

1534
```
Object Neuro Key    "Gait"
Object Neuro MMFile1 "Gait\MNGaitC.avi"
Object Neuro Entry  "Normal gait."
```

1536
```
Object Rad Key    "Chest Film"
Object Rad MMFile1 "CXRs\NormalMale.jpg"
Object Rad Entry  "Chest film normal.  Trachea midline. No interstitial opacities."
```

1538
```
Object Rad Key    "Skull Film"
Object Rad MMFile1 "CXRs\NormalSkull.jpg"
Object Rad Entry  "Skull film unremarkable. No massses or lesions visualized."
```

FIG 15b

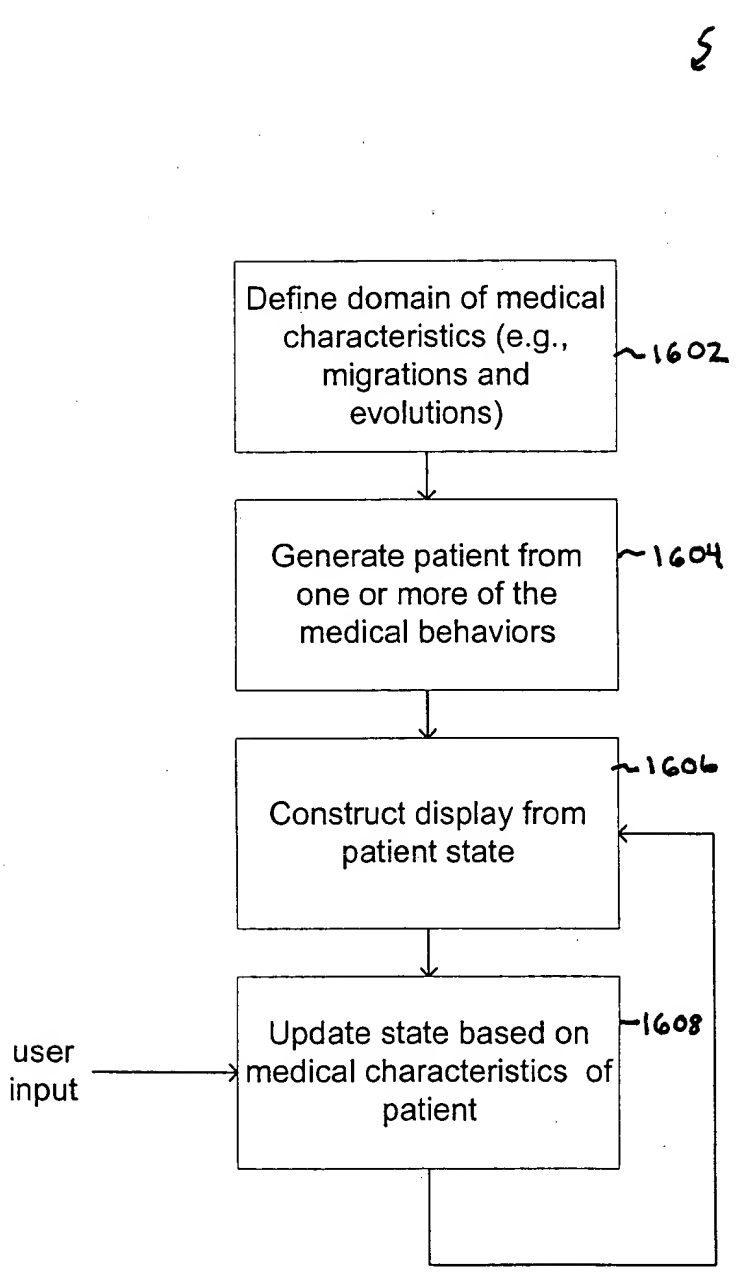

1600
Define domain of medical characteristics (e.g., migrations and evolutions)
1602
Generate patient from one or more of the medical behaviors
1604
Construct display from patient state
1606
Update state based on medical characteristics of patient
1608
user input

FIG. 16

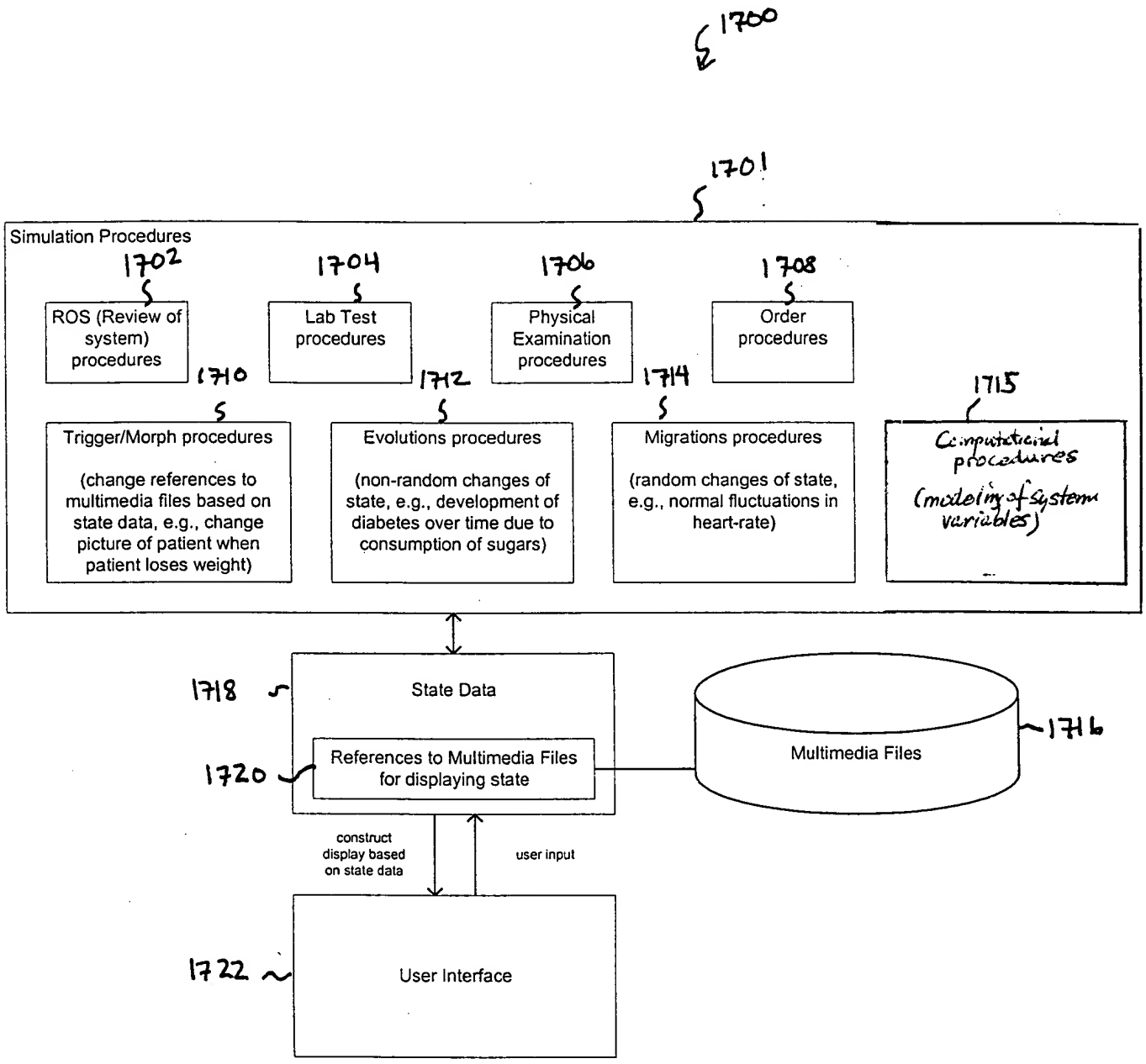

1700
1701
Simulation Procedures
1702
ROS (Review of system) procedures
1704
Lab Test procedures
1706
Physical Examination procedures
1708
Order procedures
1710
Trigger/Morph procedures
(change references to multimedia files based on state data, e.g., change picture of patient when patient loses weight)
1712
Evolutions procedures
(non-random changes of state, e.g., development of diabetes over time due to consumption of sugars)
1714
Migrations procedures
(random changes of state, e.g., normal fluctuations in heart-rate)
1715
Computational procedures
(modeling of system variables)
1718
State Data
1720
References to Multimedia Files for displaying state
1716
Multimedia Files
construct display based on state data
user input
1722
User Interface

FIG. 17

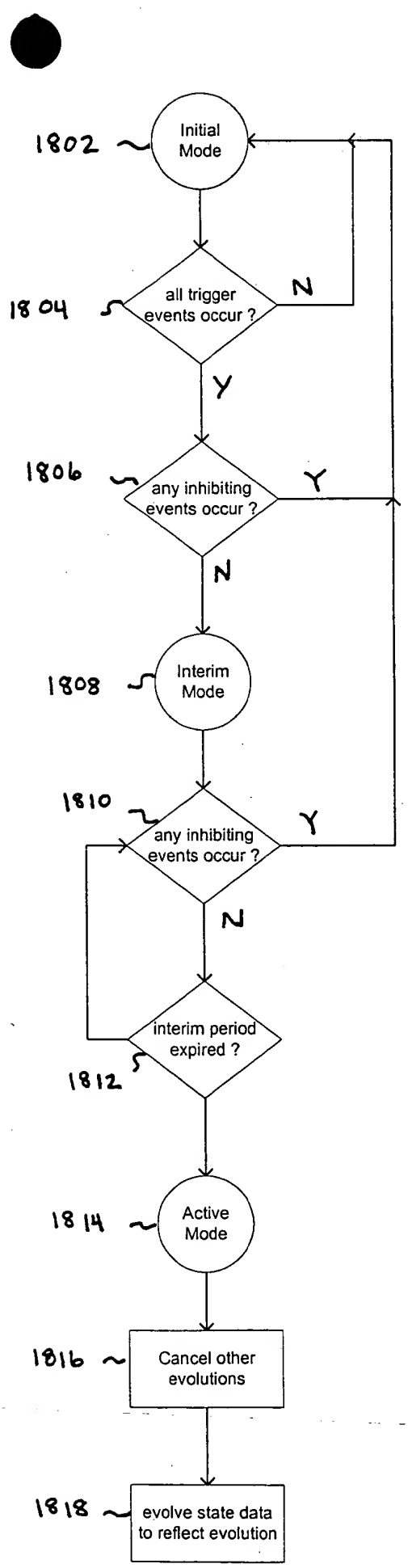

1800
1802
Initial Mode
1804
all trigger events occur ?
N
Y
1806
any inhibiting events occur ?
Y
N
1808
Interim Mode
1810
any inhibiting events occur ?
Y
N
interim period expired ?
1812
1814
Active Mode
1816
Cancel other evolutions
1818
evolve state data to reflect evolution

FIG. 18

1900

```
Evolution
1902  { Name "Diet & Exercise"
      { Number_Trigger_Events 1
      { Trigger_Type Action
      { Trigger_Index "Diet & Exercise"

1904  { Number_Initial_Inhibiting_Events 1
      { Initial_Inhibiting_Event_Type Evolution_Started
      { Initial_Inhibiting_Event_Index "Diet & Exercise"
      { Initial_Inhibiting_Event_Value 1

1906  { Interim_Mode_Time 4
      { Interim_Mode_Units Days

1908  { Number_Interim_Inhibiting_Events 0
      { Number_Evolutions_to_Cancel 0

      Number_Evolving_Variables 4

19103 { Variable_to_Evolve "Vital_Weight"
      { Importance 4
      { Target_Multiple 0.90
      { Target_Increment 1
      { Target_Variance 1
      { Time 62
      { Time_Units Days
      { Time_Variance 2
      { Curve_Index 1
      { Evolve_Variance 2

19106 { Variable_to_Evolve "Glucose, Fasting"
      { Importance 3
      { Target_Multiple 0.90
      { Target_Increment 1
      { Target_Variance 1.5
      { Time 52
      { Time_Units Days
      { Time_Variance 1
      { Curve_Index 1
      { Evolve_Variance 1.25

1910c { Variable_to_Evolve "Glucose, Plasma"
      { Importance 5
      { Target_Multiple 0.95
      { Target_Increment 1
      { Target_Variance 1.25
      { Time 42
      { Time_Units Days
      { Time_Variance 1
      { Curve_Index 1
      { Evolve_Variance 1.45

1910d { Variable_to_Evolve "Glucose, 2h Postprandial"
      { Importance 2
      { Target_Multiple 0.95
      { Target_Increment 1
      { Target_Variance 1.25
      { Time 42
      { Time_Units Days
      { Time_Variance 1
      { Curve_Index 1
      { Evolve_Variance 1.75

End_Evolution
```

FIG. 19

2000

```
Migration
Name     "ACT"
Comment  "Activated clotting Time"
Units    "s"
Variable          "ACT"
Start    143
Min      114
Max      186
Time_Step         1
Time_Unit         Minutes
Variance          0.4
Time_Jump         2
End_Migration
```

2002

2004

2006

FIG. 20

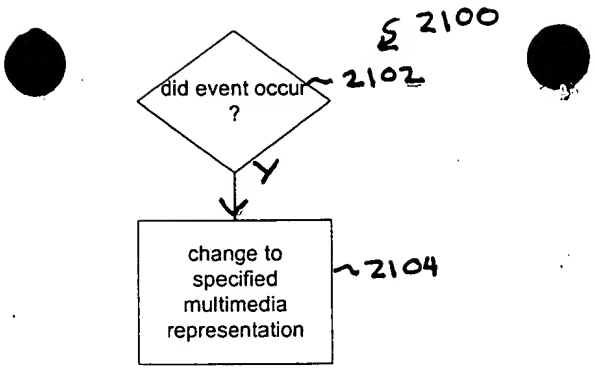


FIG. 21

```
Object Chest Key    "Back Percussion"
Object Chest MMFile "Body Renderings\New_Male_Fat\ChBkMPercuss.jp
g"
Object Chest Sound1 "Wav Files\Percussion\PercusResonant.wav"
Object Chest Sound2 "Wav Files\Percussion\PercusResonant.wav"
Object Chest Sound3 "Wav Files\Percussion\PercusResonant.wav"
Object Chest Sound4 "Wav Files\Percussion\PercusResonant.wav"
Object Chest Sound5 "Wav Files\Percussion\PercusResonant.wav"
Object Chest Sound6 "Wav Files\Percussion\PercusResonant.wav"
Object Chest Sound7 "Wav Files\Percussion\PercusFlat.wav"
Object Chest Sound8 "Wav Files\Percussion\PercusFlat.wav"
```

2202

```
Trigger
Name "ChangeBackPersussion"
Object Chest Sound1 "Back Percussion"
Variable_Index "Weight"
Min 100
Max 120
Object_String "Body Renderings\New_Male_Slim\ChBkMPercuss.wav"
```

2204

2206

FIG. 22

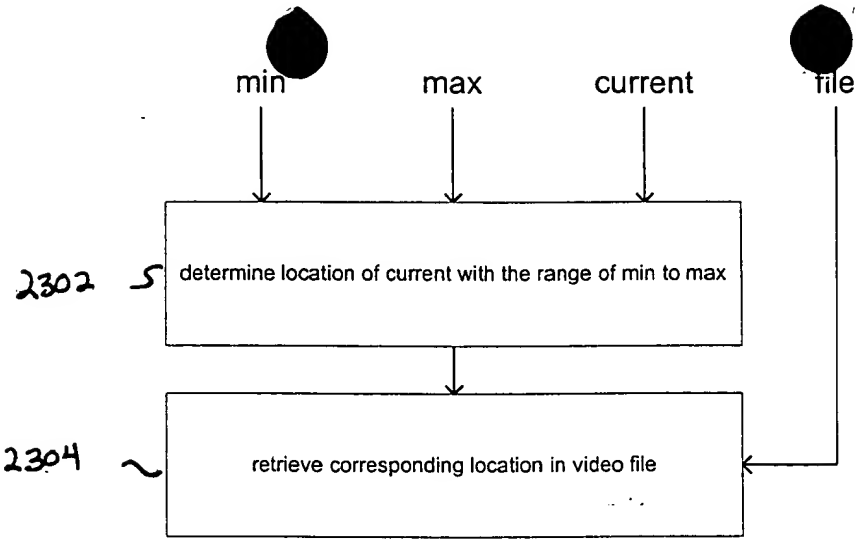


FIG. 23

```
Morph
Name   "vital_weightM"
Comment      "No Comment"
Variable     "vital_weight"
Min    164.0
Max    184.0
End_Morph
```

FIG. 24

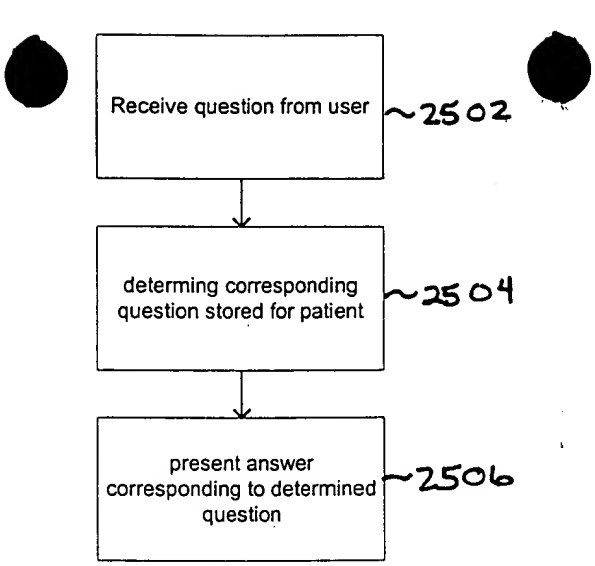


FIG. 25

```
Object ROS Question   "Have you felt fatigued?"
Object ROS Answer   "Well, I do find myself more tired at the end
of the day lately, even though my job hasn't changed in years."
Object ROS Keywords   "tire, fatigue, letharg"
Object ROS Entry   "Fatigued at the end of the day."
Object ROS MMFile1 "Body Renderings\FFaces\sullen.jpg"
```

FIG. 26

```
Object Lab Test "Acetone"
Object Lab Description "No migration - Neg/Pos"
Object Lab Entry "Neg/Pos"
```

FIG. 27

```
Object Order Action "Acarbose"
Object Order Description "Oral Antidiabetic - Precose"
Object Order Entry "Given to patient PO; tolerated well"
```

FIG. 28

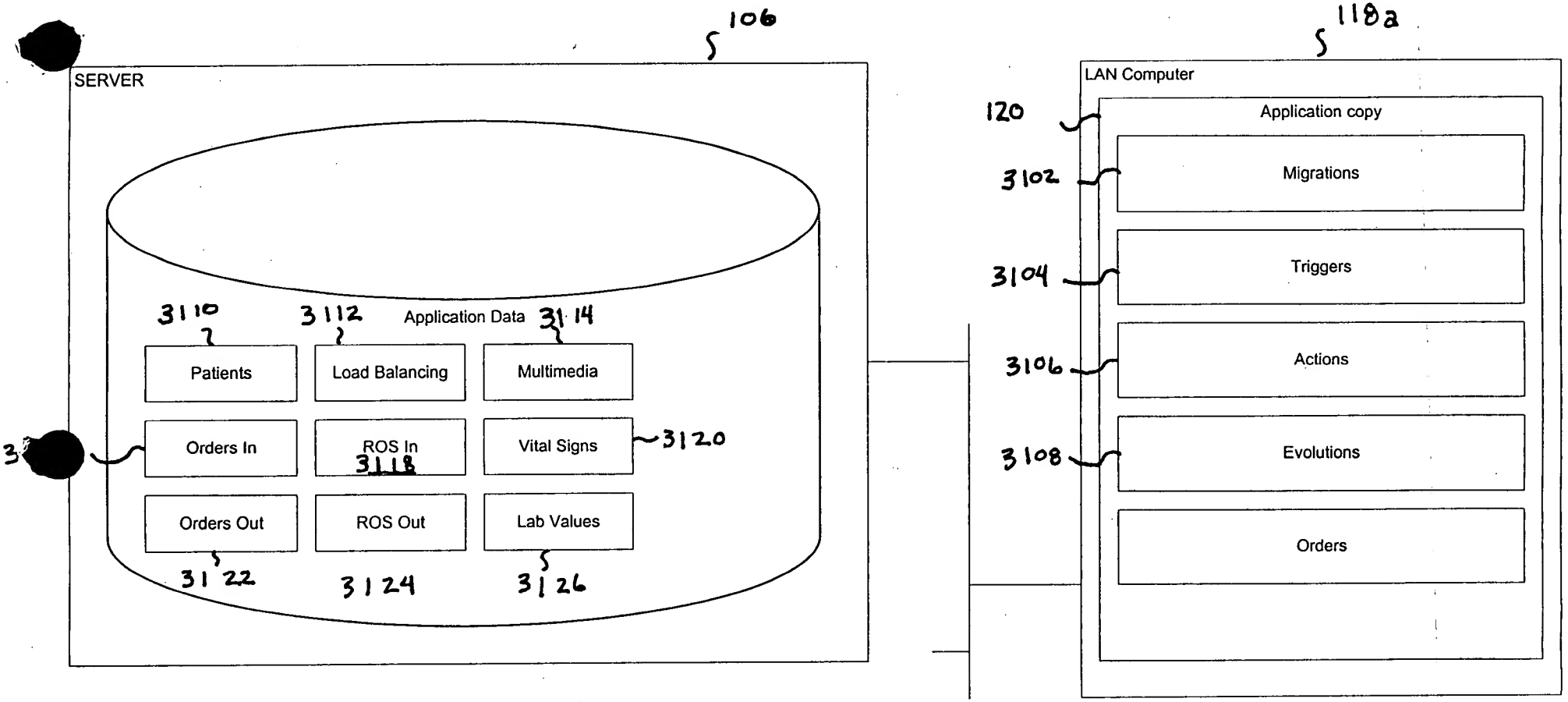
```
Object Physical Key "Oral Temperature"
Object Physical Text "Oral Temperature: $temperature$"
```

FIG. 29

```
COMPUTATION
Name            "Vital_BP_Diastolic"
Comment         "no comment"
Units           "mmHG"
Variable        "Vital_BP_Diastolic"
Method_Name"ComputeBPDiastolic"
Number_Arguments 1
Argument_Variable "Vital_BP_Systolic"
Variance        2
End_Computation
```

FIG. 30

FIG. 31


106
SERVER
3110
3112
Application Data
3114
Patients
Load Balancing
Multimedia
Orders In
ROS In
3118
Vital Signs
3120
Orders Out
ROS Out
Lab Values
3122
3124
3126
118a
LAN Computer
120
Application copy
3102
Migrations
3104
Triggers
3106
Actions
3108
Evolutions
Orders